

Appl. No. 10/649,676
Amendment dated: September 7, 2004
Reply to OA of: July 12, 2004

Amendments to the Specification:

Applicants attach at the end of this paper a newly executed Declaration as required by the Examiner as set forth on page 2 of the Official Action.

Applicants have amended the Abstract which is attached at the end of this paper on a separate sheet.

On page 1, please replace third full paragraph with the following amended paragraph which bridges page 2.

Conventionally, the optical waveguide component is prepared from silicon dioxides material by Chemical Vapor Deposition (CVD), Flame Hydrolysis Deposition (FHD), Vacuum Deposition (VD), Sputtering method, or Spin-on Glass (SOG) methods to form an optical communication waveguide material. To adjust a refractive index of the silicon dioxides as a core layer or as an outer layer, the silicon dioxide is usually dopanted doped with minor amount of other oxide such as titanium dioxide. However, preparation of the waveguide material by CVD, FHD, VD, and Sputtering method is high cost since the used equipment is complicated. Also, a waveguide material prepared from pure inorganic silicon dioxide by Spin-on Glass (SOG) method encounters with a problem of insufficient thickness. Recently, since optical communication elements have been demanded increasingly, a waveguide component based on polymeric material has been paid attention due to its low cost and easily processing. Some polymeric materials have been proposed in many patents publication, such as acrylates (USP 5,062,680), polyimide (USPs 5,108,201; 5,572,619; 5,598,501; and 5,659,648), polysiloxane (USP 5,972,516) etc. However, a carbon-hydrogen bond vibration energy of the polymeric material will be lost largely at wavelengths of 1310 nm and 1550 nm which are the wavelengths of light source used in current optical communication, therefore application of the optical waveguide component is greatly limited. An improved proposal has been

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proposed that use of a fluorinated polymeric material such as fluorinated acrylate and fluorinated polyimide could reduce its light-transmission loss due to a carbon-fluorine bond substituting for the carbon-hydrogen bond present in polymeric material. However, a florinated fluorinated monomer is expensive and its synthesis is difficult, which in turn limits the application of the fluorinated polymeric material in waveguide field. Furthermore, disadvantages of the fluorinated polymeric optical waveguide component are directed to its insufficient heat-resistance and mechanical property. Therefore it is difficult to prepare a channel waveguide from such a flourinated fluorinated polymeric material.

On page 2, please replace the last full paragraph which bridges page 3 with the following amended paragraph.

Based on the above disadvantages of the inorganic material and polymeric material, a new material of composite film consisting of polymer/inorganic oxide has been developed. Such a new material not only improves the heat-resistance and mechanical property of polymeric material by using nano-meter inorganic oxide but also improves the adjustment of its ~~reflective~~ refractive index and optical window. It is because the ~~reflective~~ refractive index of the inorganic oxide can be adjusted in a wide range and incorporation of the inorganic oxide into the polymeric material will decrease CH bond density in the material. However, most polymer/inorganic oxide composite material is prepared in a block form. If it is prepared in the form of a film, it will cause light scattering loss resulting from large size of the inorganic oxide. Thus, such a polymer/inorganic oxide composite material is not suitable for optical film. Accordingly, use of ~~currently~~ current polymer/inorganic oxide composite material as optical waveguide component has the following problems: (1) size of the inorganic oxide is too large; (2) it is difficult to prepare an optical film; and (3) film thickness of the composite is insufficient.

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On page 4, please replace the last full paragraph which bridges page 5 with the following amended paragraph.

The present invention relates to a process for preparing an optical waveguide component from acrylate/titanium alkoxide composite material, which comprises the following steps: (a) reacting acrylate with titanium alkoxide in the presence of silicon coupling agent and water by an acid-free sol-gel method to form a precursor solution of an acrylate/titanium alkoxide composite material; (b) coating the resultant precursor solution on a silicon chip on which a silicon dioxide has been previous coated, and then evaporating solvent from the solution at a temperature of from 50 to 200°C, preferably from 140 to 160°C, more preferably from 145 to 155°C to form a acrylate/titanium alkoxide composite material film; (c) forming a channel on the resultant film by lithographic method; (d) repeating the step (a) except using a ratio of acrylate and titanium alkoxide different from that used in step (a) to form a precursor solution having a ~~reflective~~ refractive index less than the precursor solution obtained from step (a); and (e) applying the precursor solution obtained in step (d) on the composite material film having channels in step (c), evaporating solvent at a temperature of from 70 to 90°C, preferably from 50 to 70°C, and more preferably from 55 to 65°C, and then baking at a temperature of from 50 to 200°C, preferably from 140 to 160°C, and more preferably from 145 to 155°C, to ~~produced~~ produce the optical waveguide component of acrylate/titanium alkoxide composite material according to the present invention.